Institutional Effectiveness Report
Academic Year 2010-2011
Physics and Engineering Technology

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Mission and Goals

Physics

The Department of Physics and Astronomy offers a baccalaureate degree in Physics with a concentration in Computational Physics or Health Physics. Students completing the majors offered by the department will be prepared for careers in industry and scientific research or for graduate school.

Engineering Technology

The Francis Marion University B.S. degree programs in Civil Engineering Technology (CET) and Electronics Engineering Technology (EET) allow students with an associate's degree in Engineering Technology or those in pursuit of such a degree to earn their bachelor's degree after approximately two years of additional coursework. FMU's Engineering Technology programs provide a unique cooperative educational opportunity to students and workers of the Pee Dee region and South Carolina by offering a liberal arts education to Engineering Technology students from the state's Technical Colleges in addition to their chosen technical and scientific training. The Engineering Technology degree programs enable graduates to compete more effectively for technical positions within local and regional industry.

Assessment Activities

Student learning and development	**2005-2006**	**2006-2007**	**2007-2008**	**2008-2009**	**2009-2010**	**2010-2011**
All laboratory courses will require mandatory written lab reports. Benchmark: 70% of the physics and engineering technology majors who complete the 300 and 400 level physics laboratory courses will submit a complete set of laboratory reports for each course.	28/33 (85%)	30/35 (86%)	38/44 (86%)	39/48 (81%)	22/28 (79%)	26/33 (78%)
Physics majors will complete one or more senior projects in PHYS 419 and420 and will submit a written report. Benchmark: The written reports will be graded by two physics faculty members, assessed for accurate and clear scientific information reporting, and 70% of the students will score 4 or more on a 1-7 point scale.	8/8 (100%)	8/8 (100%)	8/8 (100%)	8/8 (100%)	7/7 (100%)	9/10 (90%)
Physics majors will be required to make at least one oral scientific report. An oral presentation based on a student's senior projects will be required as part of PHYS 420. Benchmark: Students will make an oral presentation at a special Society of Physics Students meeting, which will be evaluated by the physics faculty and at least one faculty member from another discipline for oral presentation quality. The mean score for these presentations should be at least 70 on a 100-point scale.	3/3 (100%)	2/3 (67%)	6/6 (100%)	2/2 (100%)	0/0	3/3 (100%)
Instructional Technology	**2005-2006**	**2006-2007**	**2007-2008**	**2008-2009**	**2009-2010**	**2010-2011**
Students will be required to demonstrate the ability to use computers to solve physics problems Physics 301 or Physics 302 or Physics 401. Benchmark: one computer project will be completed in either physics 301, 302, or 401 and 70% of the	3/4 (75)	3/3 (100%)	9/12 (75%)	6/7 (86%)	7/8 (87)	13/18 (72%)

students will score 4 or better on a 1-7 point scale of computer use, as assessed by two faculty members.						

Reviews Of Student Graduate School Admission And Fellowship Or Assistantship Acquisition	**2005-2006**	**2006-2007**	**2007-2008**	**2008-2009**	**2009-2010**	**2010-2011**
Within any four-year period, 80% of FMU physics graduates who apply to graduate school in a related discipline will be accepted.	3/3 (100%)	6/6 (100%)	4/4 (100%)	3/3 (100%)	3/3 (100%)	1/2 (50%)
One in eight of FMU physics graduates who are accepted to graduate school in a related field will receive a fellowship or assistantship.	3/3 (100%)	5/6 (83%)	4/4 (100%)	3/3 (100%)	3/3 (100%)	1/1 (100%)
Faculty Service To The University And To The Community	**2005-2006**	**2006-2007**	**2007-2008**	**2008-2009**	**2009-2010**	**2010-2011**
The level of involvement of the physics faculty in University committees will be evaluated through an examination of the faculty's annual reports. The benchmark for this activity is for the department's faculty, on average, to serve on at least two campus committees.	17/6 (2.8)	18/7 (2.6)	22/7 (3.1)	23/7 (3.3)	24/7 (3.4)	22/7 (3.1)
The extent of the physics faculty's participation in activities of the community at large is assessed through an examination of the faculty's annual reports. Value listed is the number of documented activities.	30	35	18	27	20	26

Issues and Actions

Issues of Concern 2005-2009	***Actions Taken***
Improvements to the Computational Physics major: Program requirements, course content, and facilities	• The computational physics courses (220,306,406) have been transformed to make use of Easy Java Simulations (EJS), which allows students to more easily make professional-looking sophisticated simulations. • A new set of laptop computers has been ordered, primarily for use in the introductory physics courses. This will allow for use of the latest software and other capabilities in addition to relieving some of the competition for the laptops. • New topics have been added to the PHYS 314 Modern Physics course, including Single Photon Interference and Quantum Mechanical Tunneling.
Improvements to the Health Physics major: Program requirements, course content, and facilities	• A grant was received from the Nuclear Regulatory Commission for scholarships given to the health physics students, which can provide up to $5000 per semester to each recipient. • An additional internship agreement was reached with Progress Energy, which provided six student internships during the summer of 2010. • The relatively new PHYS 418 course was modified to include discussions and projects related to environmental concerns at nuclear power plants, including the recent events in Japan.
General improvements	• A new set of laptop computers has been ordered for use in the physical science laboratory, replacing 10 year-old computers. This upgrade will allow for the use of more recent versions of the Logger Pro software. This will allow, for example, experiments that involve video capture of data. • The ASTR 201 and 202 courses have been modified to include enhanced class support by internet, via Blackboard • With money from stimulus grants, a photometer and a CCD cameral were purchased for use with the observatory. These can be incorporated into the astronomy courses and used for student research projects.

Recruiting of students	• The department's major recruiting effort SCPSI continues to be modified and improved. Students can now apply online, in addition to the paper/mail-in forms. This seems to be popular among potential recruits, with applications reaching record levels. • We are considering modifying the Friday night program for SCPSI, which includes a demonstration program, liquid nitrogen/pizza party, free time at the University Center, games/movie at the Planetarium. It has been suggested that these events make for a long evening and could perhaps be shortened without sacrificing positive attributes.

Assessment of General Education Courses

The Department of Physics and Astronomy has chosen to assess its General Education offerings by having students complete a survey concerning the results of an experiment they have just designed and completed. The techniques of data acquisition, experiment design, and analysis required in this experiment are considered representative of the students' mastery of the laboratory course material.

The experimental problem given to the students concerns a simple pendulum. The students must identify variables that may effect the time period of a pendulum (length, mass, amplitude) and investigate to see which one(s) actually have an influence. By analyzing the results, the students attempt to develop an empirical equation that correctly predicts the time period for any simple pendulum.

A copy of the survey questions and a reporting of the results follow.

SURVEY FOR PSCI 101 FINAL EXAM
SIMPLE PENDULUM EXPERIMENT

Directions: In response to the following questions, circle the answers that best characterize your results from the Simple Pendulum Experiment.

1. Did variations in the amplitude of the oscillating pendulum affect its time period?
   a) The amplitude had no effect on the time period.
   b) The amplitude seemed to have a slight effect on the time period.
   c) The amplitude had a major effect on the time period.

2. Did variations in the length of the oscillating pendulum affect its time period?
   a) The length had no effect on the time period.
   b) The length seemed to have a slight effect on the time period.
   c) The length had a major effect on the time period.

3. Did variations in the mass of the oscillating pendulum affect its time period?
   a) The mass had no effect on the time period.
   b) The mass seemed to have a slight effect on the time period.
   c) The mass had a major effect on the time period.

4. Which of the following expressions best characterizes the relationship between the time period (T) of a simple pendulum and its length (l)?

   a) $T = kl$
   b) $T = k\sqrt{l}$
   c) $T = kl^2$
   d) $T = \frac{k}{l}$
   e) none of the above

Survey Results
(last four years)

Question #/Response characterizations	**2007-2008 (242 students)**	**2008-2009 (205 students)**	**2009-2010 (210 students)**	**2010-2011 (250 students)**
1.Correct	97 (40%)	92 (45%)	96 (45%)	72 (29%)
Incorrect/reasonable	126(52%)	99 (48%)	103(48%)	133(53%)
Incorrect	19 (8%)	14 (7%)	37 (7%)	45 (18%)
2.Correct	203(84%)	144(70%)	149(70%)	157(63%)
Incorrect/reasonable	39 (16%)	43 (21%)	44 (21%)	53 (21%)
Incorrect	0 (0%)	18 (9%)	8 (9%)	15 (6%)
3.Correct	109(45%)	89 (43%)	91 (43%)	103(41%)
Incorrect/reasonable	116(48%)	79 (39%)	82 (38%)	120(48%)
Incorrect	17 (7%)	36 (18%)	37 (17%)	27 (11%)
4.Correct	83 (34%)	9 (4%)	9 (4%)	25 (10%)
Incorrect/reasonable	142(59%)	137(67%)	143(67%)	120(48%)
Incorrect	17 (7%)	57 (28%)	16 (8%)	90 (36%)

Commentary: It seems that improvements in student performance are minimal to non-existent. The students as a whole are performing at a reasonable level, but we feel it could be better. One change that will be made to the final experiment (from which these results are obtained) is to make the instructor's approach and direction to the students more uniform. In the past, these instructors have been free to conduct this experiment as they chose, but it seems that this approach has led to differences that put some students at a disadvantage in answering the survey questions. It is anticipated that a more uniform approach will lead to improved results.